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QUICK RELEASE HAND CONTROLS FOR AUTOMOBILES PROTOTYPE DESIGN AND EVALUATION

Prepared For:

TRANSPORTATION DEVELOPMENT CENTRE
TRANSPORT CANADA
MONTREAL, QUEBEC

Prepared By:

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CONSULTING ENGINEERS
OTTAWA, CANADA

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The contents of this report reflect the views of the Contractor, and not necessarily the official views or policies of the Transportation Development Centre.

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17. Abstract

This report documents the various phases of the study - conceptual design, prototype build, and evaluation - of a quick release hand control unit for automobiles. Canadian and American safety regulations regarding hand control use and operation were investigated before the selection of an existing hand control unit for conversion to the proposed design. The hand control unit was modified where it attaches to the brake pedal, throttle pedal, floor, and steering column in order to accommodate four locking pins, which hold the unit in place and enable a three-minute installation, and a one-minute removal time. In order to realize the full potential of this quick release feature, it is recommended that the prototype unit be tested in an in-field evaluation in collaboration with a rental car concessionaire.

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17. Résumé

Ce rapport élabore les différentes étapes - d'étude dessin conceptuel, construction de prototype, et évaluation - d'un système de commandes manuelles à démontage rapide pour automobiles. Après un examen des règlements canadiens et américains de sécurité relatifs à l'usage et au fonctionnement des systèmes de commandes manuelles, on a choisi pour ce prototype, et ensuite modifié, un appareil déjà disponible. Les modifications ont été apportées à l'appareil aux endroits où il est fini à la pédale de frein, à l'accélérateur, au plancher et à la colonne de direction, afin d'incorporer un tige facilement détachable. Quatre de ces tiges tiennent l'appareil en place et facilitent l'installation en moins de trois minutes et le démontage en une minute. Pour bien apprécier la valeur totale de cet appareil, on recommande de la soumettre à des essais chez un concessionaire de voitures de location à l'aéroport.

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SUMMARY

This report is a result of a study, design, and prototype build undertaken by Davis Engineering Limited to implement a means by which hand controls may be quickly and easily installed and removed from a conventional motor vehicle. The prestudy consisted of:

i) an investigation of the Transport Canada Policy/Agreement, clarifying implications of the Canadian Human Rights Act, and negotiable terms between Transport Canada and rental car concessionaires;

ii) establishing the needs of disabled drivers from various handicapped groups and organizations;

iii) an investigation of the provincial regulations regarding restrictions and licencing of hand control equipped vehicles;

iv) a survey of car rental concessionaires to ascertain the types of vehicles preferred or used by them, and to ascertain their views on the use of hand controls; and,

v) an investigation of U.S. Department of Veterans Administration acceptance and test standards which may apply to various existing hand controls.

The prestudy data was then used in the preparation of design and test specifications for the prototype hand control unit. A prototype installation was then undertaken utilizing a modified "Wright-Way Inc." hand control unit in a Chevrolet X-body Citation.

Functional tests of the unit were performed in Transport Canada's Motor Vehicle Test Centre in Blainville, Quebec; several members of the Steering Committee tested the function of the hand controls, and the quick release mechanisms. Following these tests, it was agreed that a second "A" body vehicle (Oldsmobile Cutlass) should be used for an installation of the quick release hand controls for demonstration purposes. Rental car concessionaires and various members of the media were given demonstrations of the quick release features of the hand controls, and their comments are documented in this report.

Since the rental car concessionaires are interested in field testing these units, and relatively little data exists regarding the use of removable hand controls, it has therefore been recommended that an in-field evaluation of quick release hand controls be performed.

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1. INTRODUCTION

This project has been undertaken to implement a means by which hand controls may be quickly and easily installed and removed from a conventional rental vehicle at most car rental concessionaires in Canada. Since employment and travel opportunities have become increasingly available to the physically disabled, there has been a corresponding increase in their demand for the opportunity to use rental automobiles. Elsewhere, especially in the U.S., rental cars with hand controls are available at selected airports.

The Transport Canada Advisory Committee for the Transportation of the Handicapped has identified the desirability of having rental cars with hand controls available in Canada. The concept of a quick release hand control system offers a solution to the problem of the foreseeably low utilization rate of dedicated equipment. Thus, the development of a suitable quick release hand control system involving a minimum of vehicle modifications has been considered feasible.

Prior to any design or specification of a quick release system, a basis of information was founded outlining the needs of disabled drivers, Transport Canada policy/agreement, provincial regulations and licencing, and types of automobiles used by rental car concessionaires. Various types of existing hand control units were studied to evaluate their function, and possible adaptability for use as a quick release unit.

External agencies such as the U.S. Vetarans Administration were contacted to obtain additional information on standards that exist in other countries, to form a guideline for our final decision of hand control type to be used for prototyping.

2. TRANSPORT CANADA POLICY/AGREEMENT

At the time of this writing, Transport Canada has yet to develop a policy for hand controlled rental cars at Canadian airports. The feelings precipitated here were that this project in particular may assist in the eventual policy making by Transport Canada.

Another consideration regarding the Canadian Human Rights Act [1] amendments would require government departments to review licences, etc. for non-discrimination, wherein car rental concessionaires would fall under this Act for purposes of servicing air and rail terminals. Those under federal jurisdiction would be required to provide accessible vehicles for handicapped drivers, with the stipulation that some advance notice be given by the consumer. Currently, car rental concession agreements run from Jan. 1, 1980 to Dec. 31, 1984, and make no reference to hand controls or other devices to assist handicapped operators.

The present concensus indicates that this amendment may be addressed in the new year, 1982, by the Parliamentary Committee. Until then, there is no real impetus for rental car concessionaires to supply hand controls for use by handicapped drivers.

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[1] See copy of memo from R. Corkett to R. Nishizaki in Appendix A.

3. THE NEEDS OF THE DISABLED DRIVER

Information contained in this segment of the report has been gleaned from several sources; subscripts shall therefore be provided to indicate the publication or person(s) from which the various statements were taken. Basic assumptions have been made regarding the minimum degree of mobility/dexterity of the handicapped driver, i.e.,

(a) full use of both arms for all control functions;

(b) holder of a valid driver's licence with a handicapped restriction on the permit.

The scope of this project has also been limited to include controls for brake and throttle actuation only. Additional handicapped aids such as spinners, right hand turn indicators, left hand shift levers, dimmer switch conversions, and various knob and handle extensions shall not be dealt with in this report.

3.1 Hand Control Unit

In general, considerations given to the actuation of the throttle and brake controls are as stipulated by the Veterans Administration Rehabilitation Engineering Centre[2].

(a) Acceleration should never be actuated by pushing forward because inertial forces acting on the vehicle might cause the driver to be thrown into the accelerator;

(b) Neither brake nor accelerator should be actuated in the hands-off position;

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[2] Freeman, C.C., Evaluation of Adaptive Automotive Driving Aids for the Disabled, Bulletin of the New York Academy of Medicine, 1974, 50 (4), 536-544.

(c) Braking and throttle controls should require distinctly different and mutually exclusive motions to avoid simultaneous application of throttle and brake.

Regarding item (c) above, however, Less, Colverd, Dillon and Young[3] found that the ability to simultaneously activate the accelerator and the brake to be advantageous in situations such as parking on hills.

From 1973 - 1977, the Veterans Administration[4] conducted a driver training program to evaluate specially adapted vehicles for use by wheelchair patients, the findings of which, among other criteria were:

(a) The push-pull and push-right angle pull hand controls were easier for most handicapped drivers to operate than the push-twist control;

(b) Direction of motion for accelerating and braking should be push forward away from driver to brake, and pull toward driver or downward to accelerate;

From the above literature search and from discussions with hand controlled vehicle operators, the preferred motions for hand controls include: push away for brakes, push down (at right angles to the brake motion) for the throttle.

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[3] Less, M., Colverd, C.C., Dillon, J.J. and Young, J., Hand Controls and Assistive Devices for the Physically Disabled Driver, Albertson, New York, Human Resources Centre, 1977.

[4] Veterans Administration, Dept. of Medicine & Surgery, Veterans Administration Rehabilitation Engineering Centre, Evaluation of Specially Adapted Automotive Vans for Wheelchair Users, Washington, D.C., 1978.

Having established the preferred motions for actuation of the hand control units, the next process involved choosing an existing hand control unit, V.A. approved, which could be easily modified to accommodate the quick release feature. Through a process of elimination, the "Wright-Way Inc." hand control unit was designated as the simplest, and most easily adapted unit available. Thus, it was decided to modify this unit for incorporation as a quick release hand control. Other criteria involved in the making of the decision to use the "Wright-Way Inc." system were:

(a) unit satisfies all the basic criteria outlined in the specifications for the hand control;

(b) facility of spring tension adjustment (for return force of throttle actuator);

(c) compactness of unit for adaptation in various sized and shaped vehicles;

(d) facility with which changes or adjustments may be made for varying heights from the floor and depths from the firewall;

(e) simplicity of overall design, and "fool-proof" method of construction (i.e., linkages tend to snag on protrusions under the dashboard on some types of hand controls; gears on "Wright-Way" system are neater and less likely to be interfered with);

(f) the single rod actuator linkage doubles as a stabilizer tube as well as a torsion tube, eliminating the need for additional support fixtures attached to the hand control;

(g) the bracket arrangement for the attachment points are easily adapted to quick connecting features; and,

(h) this unit seems to be preferred by various handicapped individuals contacted in the course of this project, and who have given favourable reports on them.

3.2 Automobile

Various considerations should also be given to the choosing of the vehicle which the handicapped traveller intends to rent. Sub-compacts should be avoided as they do not afford sufficient room to store a wheelchair in the passenger compartment, nor do they offer the options desired by most handicapped travellers. Some compacts, most mid and full sized automobiles should be considered for use by disabled drivers. Two door models, as opposed to four door models, offer greater accessibility to the passenger compartment by virtue of the wider door, facilitating the ingress/egress of both the driver and his (her) wheelchair. One additional feature which may be of benefit to the traveller in snowy or rugged climates would be front wheel drive. This option offers two advantages, the more important being the additional traction afforded by front wheel drive, increasing the safety of the traveller, and the second being the reduced size of the hump on the floor, facilitating access to the driver's seat from either the left or right hand sides of the car.

Mandatory features that the vehicle must be equipped with are:

(a) automatic transmission;

(b) power steering;

(c) power brakes; and,

(d) column mounted dimmer switch.

Other options, although not mandatory, which make vehicle operation easier for the disabled driver are:

(a) tilt steering;

(b) electric seat adjustment;

(c) powered windows;
(d) pivot driver's seat;
(e) electric door locks; and,
(f) reduced diameter steering wheel.

4. PROVINCIAL REGULATIONS AND LICENCING

In general, there are no provincial regulations governing the licencing requirements for hand controlled vehicles. However, the disabled drivers in any of the provinces have a special designation on their driver's licences limiting them to the operation of hand controlled vehicles.

Hand controls in Canada do not have any acceptance standards or quality control per se. However, the Veterans Administration in the U.S. has set up a guideline for standards of acceptance for hand controls and hand control manufacturers. To date, there are some 13 V.A. accepted hand control manufacturers in the U.S., subject to criteria involving their construction standards and minimum load withstanding capabilities. The publication used for load minimums and cycle load testing stipulations is the "Program Guide - Prosthetic and Sensory Aids Service, Add-on Automotive Adaptive Equipment for Passenger Automobiles" by the Veterans Administration (March 31/78). Only V.A. approved hand control units were considered in choosing the unit to be modified for our quick release feature.

Of the 9 provinces (territories) that replied to our questionnaire, Alberta, Saskatchewan and New Brunswick stipulated that the unit installed in the vehicle should be checked by the vehicle division to ensure that the hand control unit poses no hazard to

the occupants or driver of the vehicle, and that their method of operation is satisfactory.

Most of the provinces expressed an interest in this project, and requested additional information upon completion of same (see Appendix B).

5. RENTAL AGENCIES SURVEY

A survey had been undertaken by H. Ducharme, who was with the Air Administration of Transport Canada at the outset of this project, to ascertain whether any of the major car rental agencies presently provide hand-controlled automobiles, and whether there were any immediate plans for their inclusion. A copy of the memo from H. Ducharme to R. Nishizaki dated June 16/1981 has been included in Appendix C which outlines the status of the major car rental concessionaires with respect to the inclusion of hand controls in their service. The car rental concessionaires contacted were: Avis, Budget, Econocar, Hertz and Tilden. None of the above now offers, nor has any future intentions of offering, hand-controlled vehicles for use by handicapped drivers.

In general, the above rental agencies will provide almost any type of vehicle desired. However, each agancy features a certain type of automotive manufacturer, i.e., Avis patronizes General Motors vehicles; Budget patronizes General Motors and Ford; Hertz and Tilden patronize General Motors. Chrysler vehicles are also available at each of these agencies upon demand. The percentage of each type of vehicle varies from city to city; hence, the choice of automobiles for the in-field phase of this project shall be comprised of one automobile

type from each of the three major North American manufacturers. From General Motors, any of the X-bodied vehicles may be used; Chrysler, any of the K-bodied vehicles, and Ford, either the Fairmont or the Zephyr ("A" bodied vehicles). This gives a good basis or representative sample of vehicles that are most available in rental car concessionaires in Canada.

6. DESIGN AND TEST SPECIFICATIONS

This section is subdivided into three major groupings; the hand control unit, the quick release features, and the automobile. Specifications have been derived for each of these segments individually.

6.1 Hand Control Unit

6.1.1 Operational Specifications

(a) the hand control unit shall consist of a brake and throttle actuation only;

(b) the movements of operation for the hand control shall consist of a push away from the operator to activate the brakes, and a downward (perpendicular to the brake motion) push to activate the throttle;

(c) the hand control, when let go, shall return to the neutral position of its own accord, i.e., no throttle or brake actuation;

(d) the return force of the throttle actuator shall be adjustable;

(e) the hand control unit shall be left-hand operated only (for the scope of this study);

(f) the hand control unit must be adaptable in sizing and adjustment to fit most North American automobiles found at rental car concessionaires;

(g) the installed hand control shall have no provision for electrical fixtures such as dimmer switch, or horn buttons;

(h) the hand control unit, when installed, shall not prove to be a hazard to the driver or occupants of the vehicle;

(i) the hand control shall allow for an unrestricted action from zero to full throttle condition, and from zero to full brake condition; and,

(j) the hand control unit shall conform to the existing standards set forth by the U.S. Veterans Administration.

6.1.2 Applicable V.A. Standards

The applicable V.A. Standards for this unit are condensed in Appendix D.

6.2 The Quick-Release Features

(a) All quick disconnect features shall consist of locking pin mechanisms. Actual operational loads shall be supported only by structural brackets designed for these loads.

(b) Quick disconnect devices shall not be removed by normal motions of the hand control unit in operation, nor by accidental impacts due to kick forces or unusually heavy loadings on the hand control unit.

(c) All brackets for interfacing with the hand control shall be configured such that they do not interfere with the operation, or the operator of the vehicle under normal driving conditions.

(d) The quick connect features of the hand control unit must be "child proof" to prevent their possible disablement by accidental tampering.

(e) The quick connecting features shall be easily identified by the driver of the vehicle, and may be readily checked for proper assembly.

(f) Interfacing brackets and clamps on the vehicle shall be deemed as permanent fixtures in the vehicle for their adaptive role as mounts for the quick connecting features to the hand controls.

6.3 Automobile

In order to furnish a motor vehicle with hand controls for use by a handicapped driver, the vehicle must be equipped with the following:

(a) power steering;

(b) power brakes;

(c) automatic transmission with the gearshift on the steering column;

(d) the automobile should be compact, medium or full sized; subcompacts are considered too small for use as handicapped drivers' vehicles;

(e) the automobile shall be a two-door model (vs. four-door) to allow for a wider access door to the passenger compartment.

The following are preferred, but not mandatory options for the vehicle:

(a) tilt steering wheel;

(b) electric seat adjustment;

(c) powered windows;

(d) rotating driver's seat.

6.4 Test Specifications

The hand control, when installed, shall comply with all test specifications outlined by the V.A. "Program Guide" as condensed in Appendix D of this report. All quick release features shall be designed to withstand all test loads with a safety factor of at least two on critically stressed components.

The quick release features and adjustable components shall require not more than 3 minutes to install and adjust in any model vehicle by a trained technician. Removal shall take less than 1 minute.

7. DESIGN

Consideration for design of the quick release features for hand controls involved the studying of two basic options:

a. design of a completely new hand control system exclusively derived for quick installation/removal;

b. modifications to an existing hand control unit to adapt to a quick release scheme.

While the first option appeared to be the more desirable of the two, certain shortcomings were immediately apparent in the implementation phase. In designing a completely new hand control, meeting the minimum requirements which we have set forth for these units, would require a relatively extensive test program to ensure that the product would be safe and functional. Another pitfall of using a new design would be the additional expense of producing the detailed plans for, and the eventual fabrication, of a completely new unit.

Thus, the more feasible option was to utilize an existing existing hand control unit which would most easily be adapted to the incorportation of quick release features. The chosen unit for this design was the "Wright-Way Inc." hand control unit (see Figure 1 for the installed view of the unit). This unit meets V.A. acceptance standards, and because of its simplistic design, easily lends itself to the quick release concept. Other features which influenced the choosing of the "Wright-Way Inc." hand control unit were:

(a) facility of spring tension adjustment (for return force of throttle actuator);

(b) compactness of unit for adaptation in various sized and shaped vehicles;

(c) facility with which changes or adjustments may be made for varying heights from the floor and depths from the firewall;

(d) simplicity of overall design, and "fool-proof" method of construction (i.e., linkages tend to snag on protrusions under the dashboard on some types of hand controls; gears on "Wright-Way" system are neater and less likely to be interfered with);

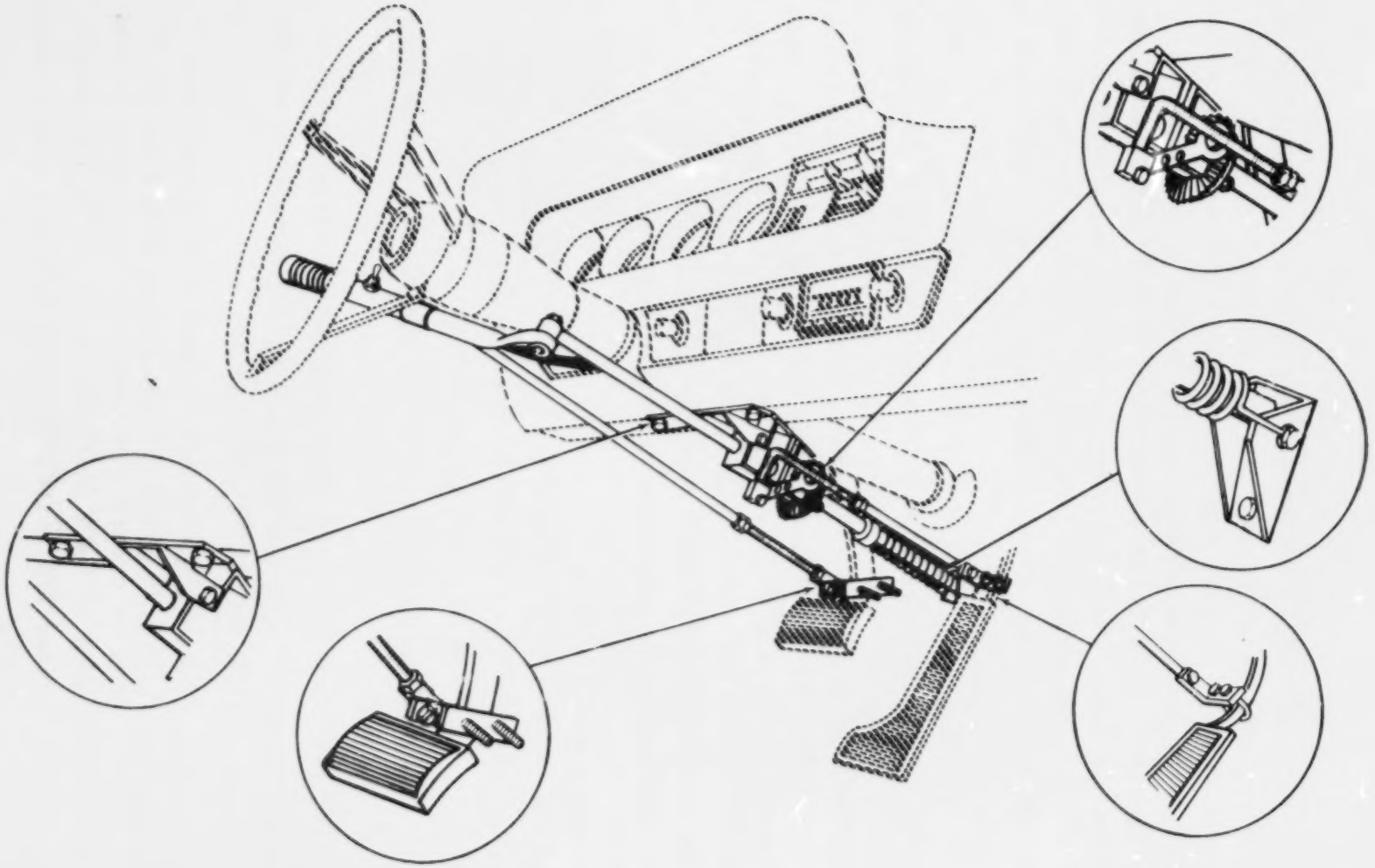


Figure 1 - Installed View of Wright-Way Inc. Hand Control Unit

(e) The single rod actuator linkage doubles as a stabilizer tube as well as a torsion tube, eliminating the need for additional support fixtures attached to the hand control;

(f) The bracket arrangement for the attachment points are easily adapted to quick connecting features; and,

(g) this unit seems to be preferred by various handicapped individuals contacted in the course of this project, and who have given favourable reports on them.

A circular was then sent to all of the members of the steering committee outlining the features of our proposed quick release hand controls configuration. The concept was accepted by the committee, and a detailed design for the brackets and modifications to the existing hand control unit was undertaken.

Three sets of the "Wright-Way" hand control units were then ordered from the "Association des Paraplégiques du Quebec" in Montreal for modifications to adapt to the quick release features. In general, the modifications are as follows:

(a) Control lever main housing: the bracket provided with the hand control that connects directly to the plastic housing is held in place by a lock pin which is removable. A second safety lock pin is provided to hold the lock pin positively in place. This assembly is bolted to the main yoke of the steering column of the automobile.

(b) Floor mounted block: a special bracket was designed to accommodate the floor mounted torsion block. A spring loaded locking pin is used here to connect the spring yoke to the floor mount.

(c) Throttle linkage bracket and socket end: the connecting linkage from the throttle actuator arm to the throttle pedal supplied with the hand control unit was moved, and a special fitting was installed. This fitting consists of a spherical rod end on the hand control throttle linkage arm, which fits into a specially designed bracket connected to the throttle linkage of the vehicle. The rod end and bracket are held together by a spring loaded locking pin.

(d) Brake linkage and socket end: this linkage is similar to the throttle linkage in almost all respects, except for actual bracket to pedal configuration. Again, the ball socket rod end is held onto the brake pedal bracket by a spring loaded locking pin.

(e) Spring tension adjuster: the spring tension adjustment controls the force with which the throttle actuator will return to the "zero" or no-throttle position. Normally, a hexagonal head ¼" Allen wrench is required to lock the spring tensioner collar to the shaft. A short piece of rod was connected to the head of the screw, enabling a hand tightening of the locking collar, which is sufficient to hold the collar to the

shaft. This modification negates the need to equip the hand controls with adjustment wrenches, i.e., all fittings and adjustments can be accomplished by hand. The above modifications are illustrated in Figures 2 and 3.

All components selected for use in the modification of the hand control unit exceed the design capacity of the original unit. In all cases, brackets, lock pins, socket rod ends and adaptive hardware have as good or better strength and safety characteristics than the original hand control equipment. Thus, it may be safe to say that all design and test criteria stipulated by the Veterans Administration acceptance standards are met by this design.

8. PROTOTYPE BUILD & FUNCTIONAL TESTS

The first prototype hand control which was fabricated was installed in an X-body vehicle, a Chevrolet Citation, two-door, with power steering and power brakes. For this first installation, the hand control unit was specifically adapted to this vehicle for pedal height adjustment and bracket location.

The unit was then tested in the vehicle for throttle/brake function, spring return settings for the throttle actuator, and ease of installation and removal. It was discovered at this time that the hand control unit could be installed and adjusted in under 2 minutes, and completely removed in under 30 seconds. Having proven that the controls had met their objectives of quick and easy installation and removal, a meeting was then held in Blainville at the Motor Vehicle Test Centre, involving the members of the Steering Committee, and the Contractor, Davis Engineering.

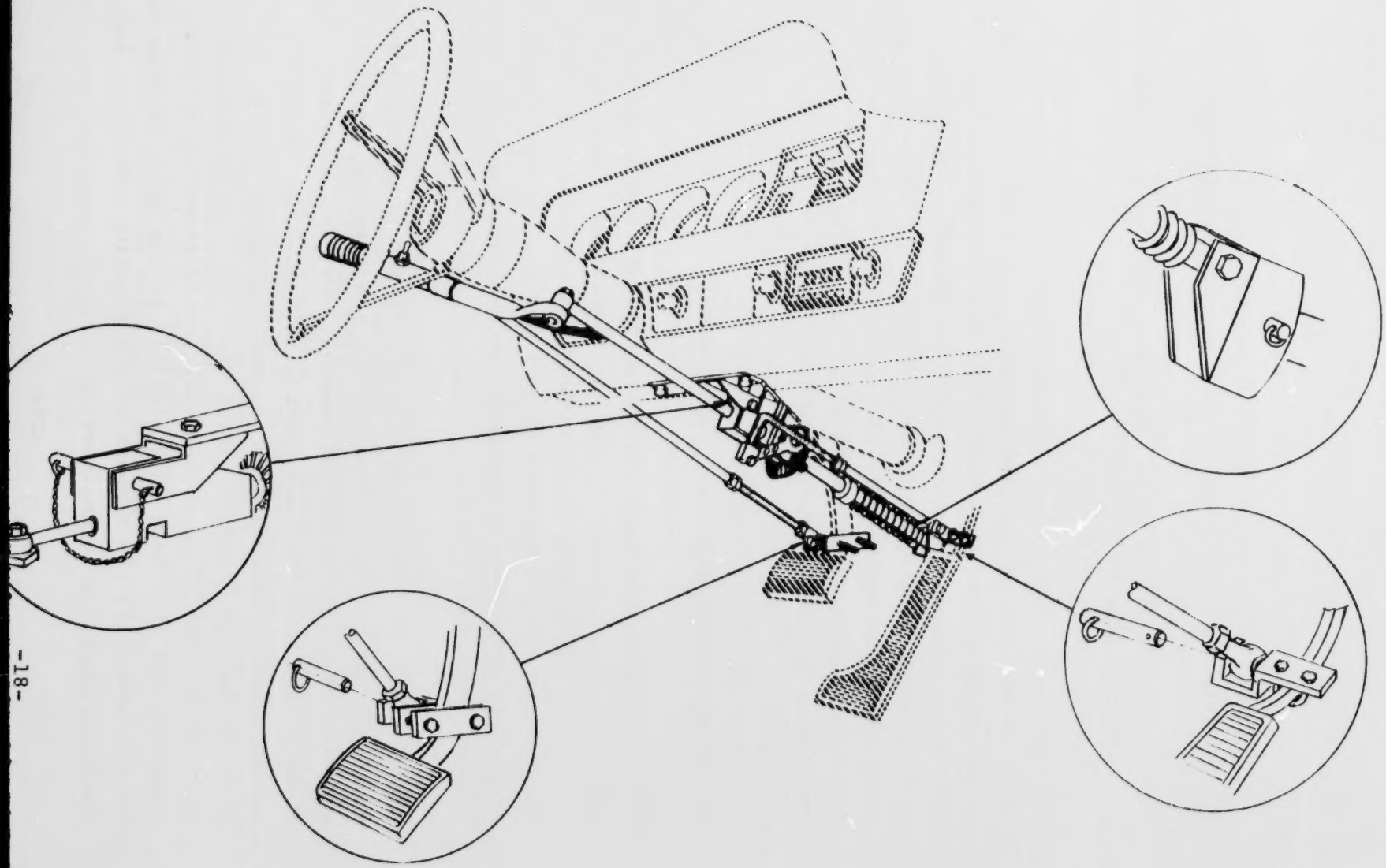


Figure 2 - Installed View of Modified Hand Controls

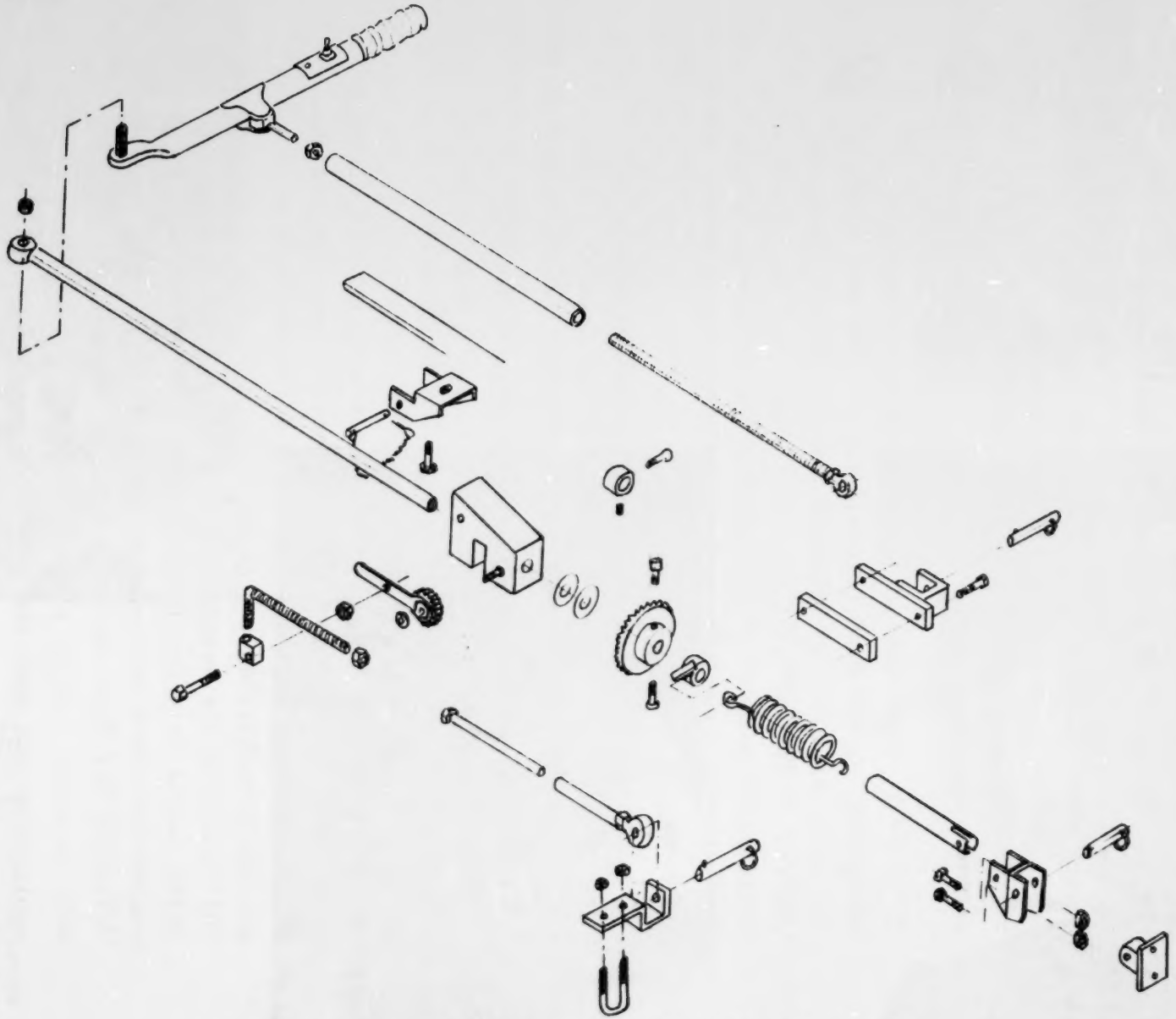


Figure 3 - Exploded View of Modified Hand Control

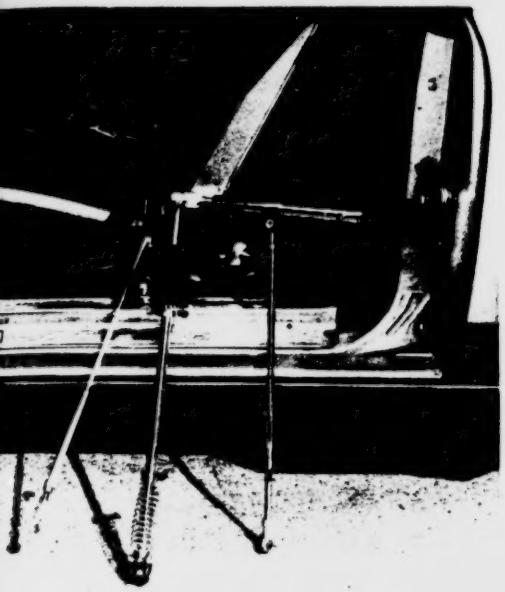
The hand controls were then tested by both paraplegics, and other members of the steering committee for their function in the vehicle on the test track. A demonstration was then given on the quick removal and installation of the hand controls, following which various members of the steering committee also installed and removed the unit.

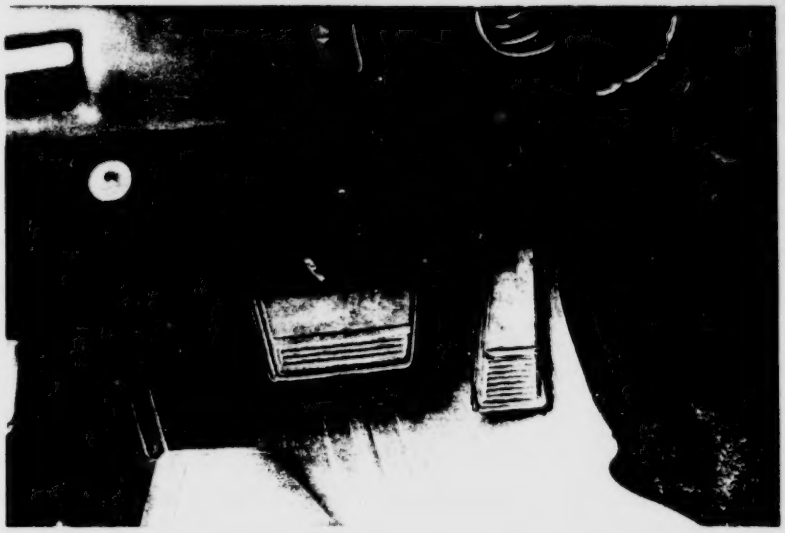
In general, reactions to the operation, design, and adjustment of the hand controls were quite favourable. The unit responded as required under both full throttle and full brake applications, and hence, met all design criteria stipulated in Section 6 of this report. Comments which were fielded at the Motor Vehicle Test Centre included:

(a) the hand control throttle linkage should be adjusted further away from the legs to prevent possible injury.(D'Arcy O'Connell); and,

(b) a more positive locking mechanism should be incorporated on the throttle and brake locking pins. (D'Arcy O'Connell, Roy Nishizaki).

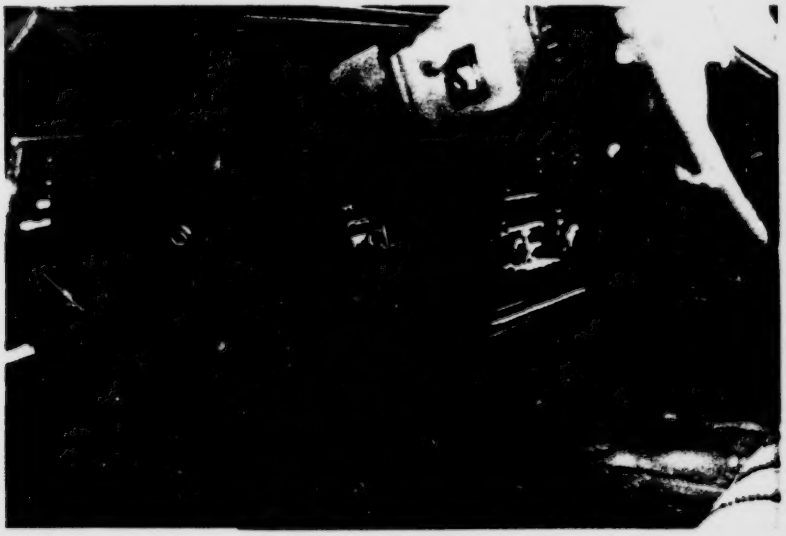
The first problem was overcome by a simple throttle linkage adjustment to move the actuator lever further upwards out of the leg area of the vehicle. A different type of locking pin was investigated to remedy the second area of concern. This included the evaluation of a "J" - type hooking pin which twists into its locked position. However, these pins may be dislodged if they are accidentally rotated, thereby disabling the hand control unit. It was decided that the ball retained locking pin was the best choice for this application but that the tolerance between the pin and the hole would be more closely controlled.

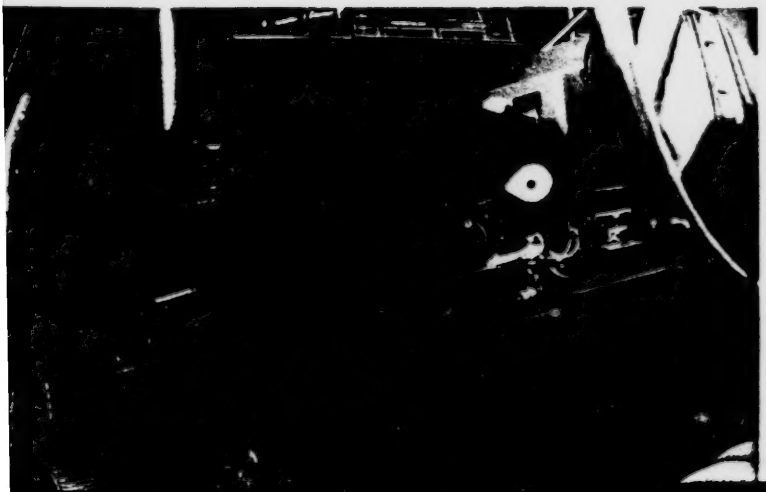




View of floor and column brackets

View of modified
hand control unit

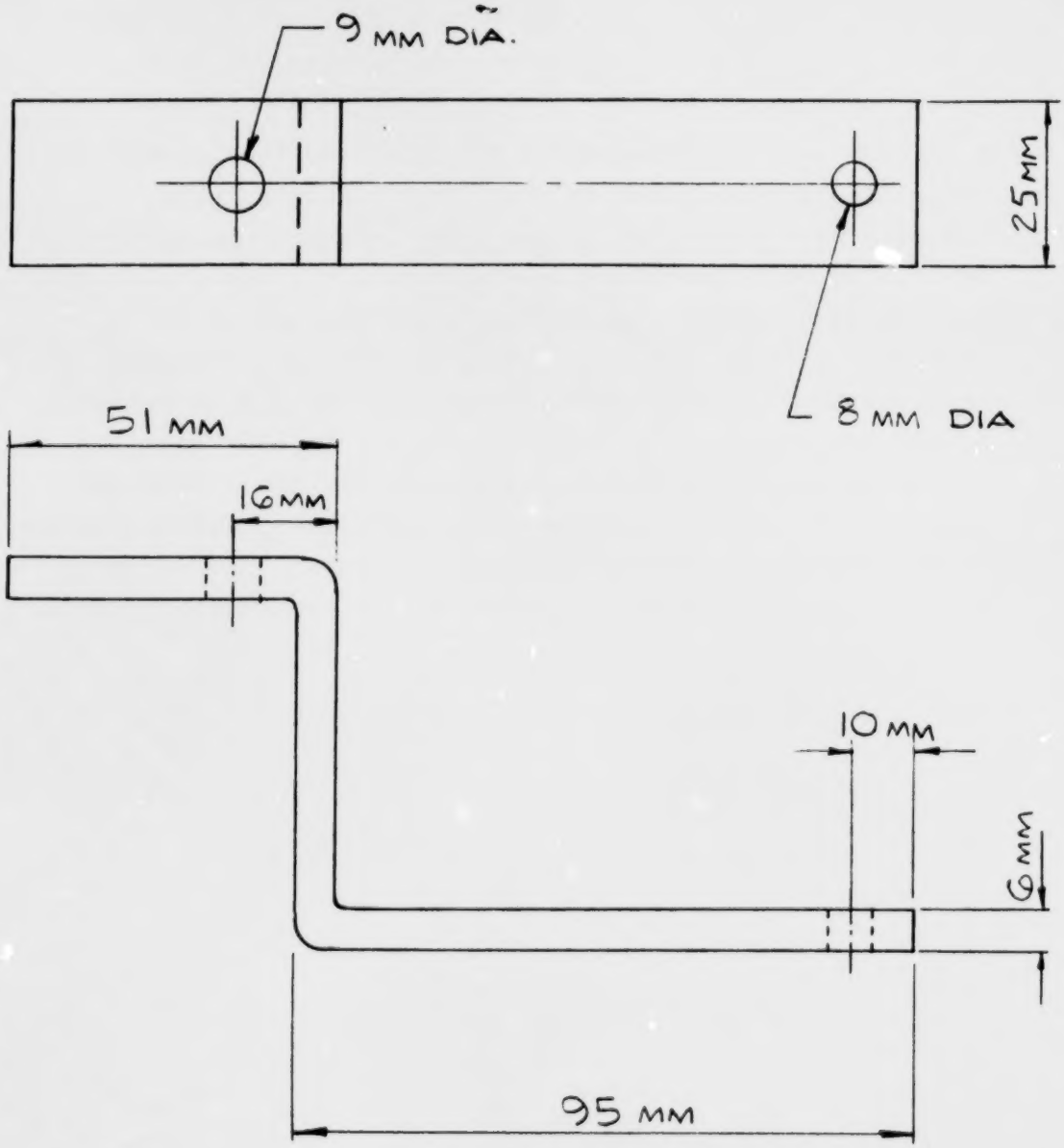




—— View of installed
hand control unit

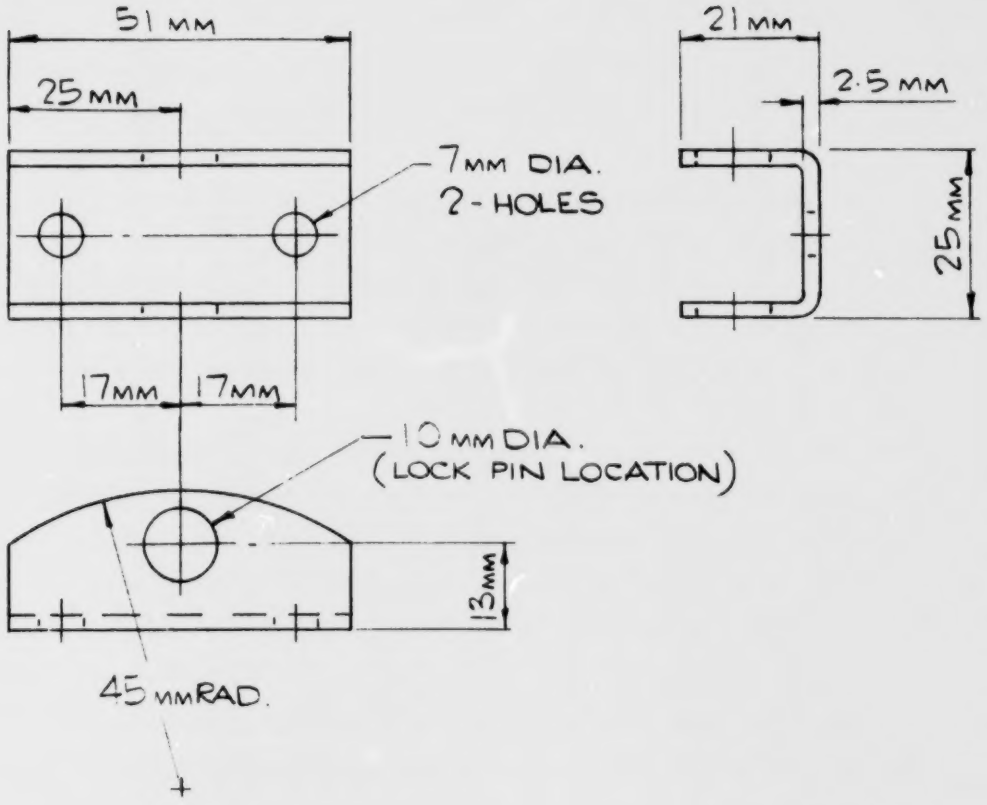
Figure 4 - Photographs of
Installed Hand
Control

An A-body vehicle (Oldsmobile Cutlass) was then chosen for adaptation to the quick release hand controls. The brackets were installed in the same locations on this vehicle as were installed in the Citation (X-body vehicle), and the same set of hand controls was adapted to this vehicle. As with the first vehicle, the hand controls were tested for their full travel on brake and throttle actuation. The unit performed properly in all functions, including quick installation and removal. This vehicle/ hand control combination was then used for our demonstration to the rental car concessionaires at Ottawa International Airport, as well as to the media on the Sparks Street Mall.



Note: This segment connects the steering yoke to the main hand control box.

Figure 5 - Steering Yoke Bracket



Floor Bracket (Intermediate)

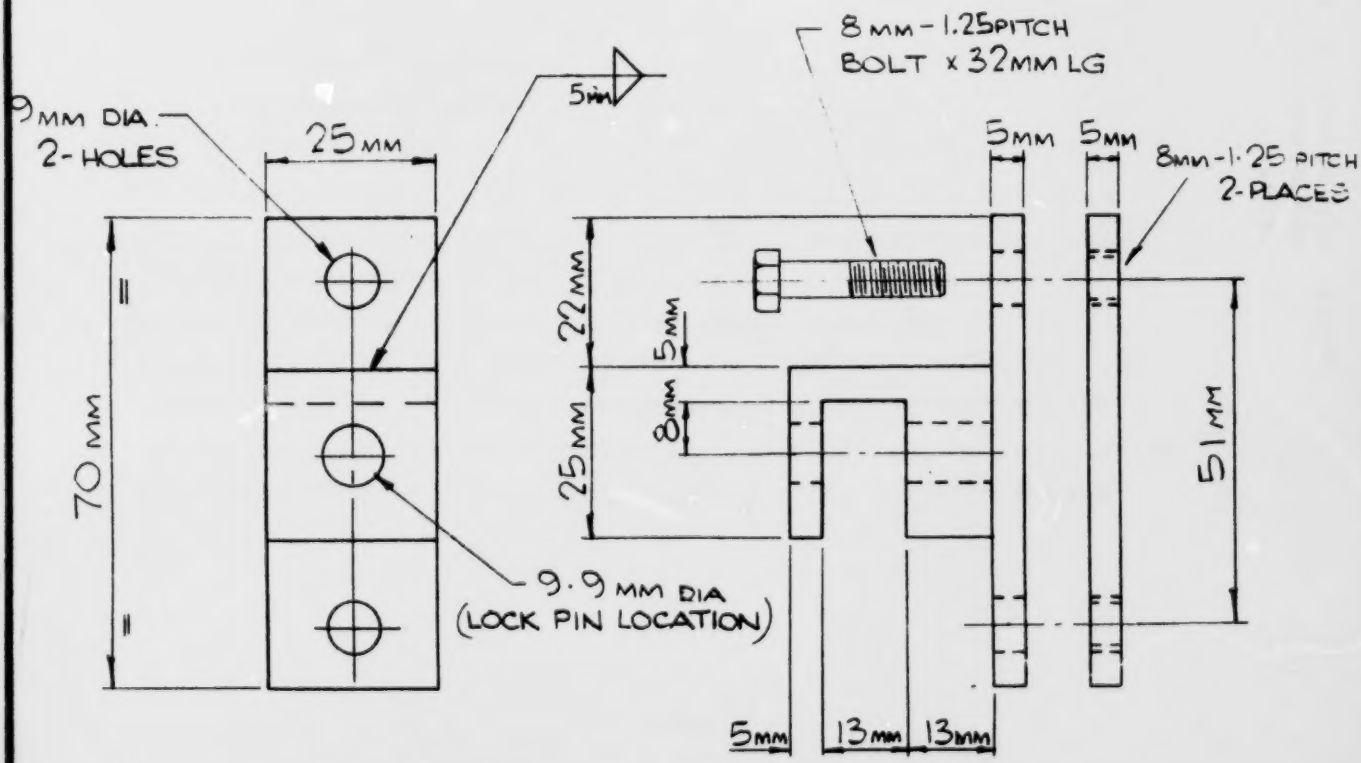


Figure 6 - Brake Pedal Bracket

Note: Applicable to 1981 Oldsmobile Cutlass, adjustments for other vehicle types may vary.

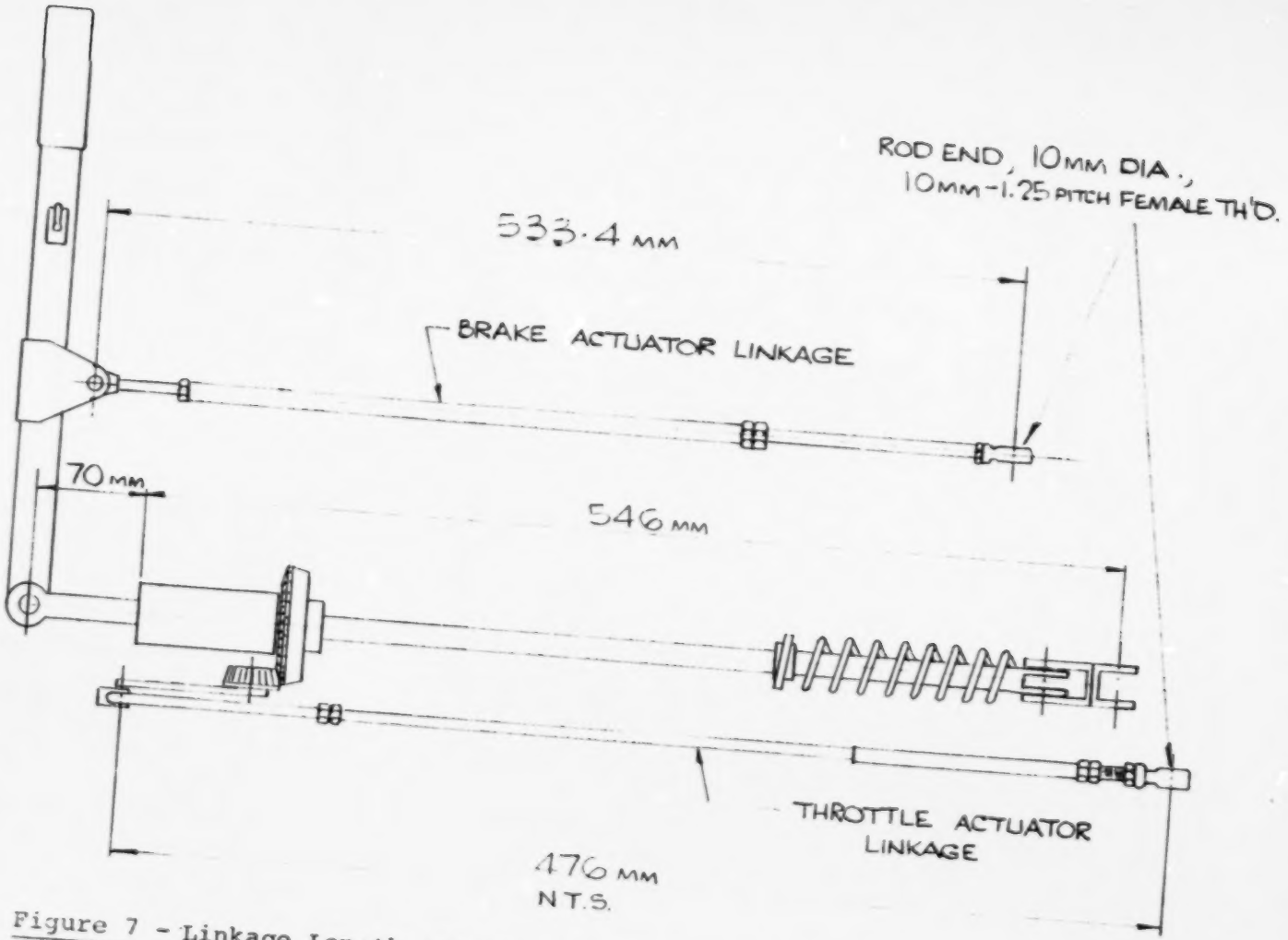


Figure 7 - Linkage Length Adjustments for Hand Control

9. FIELD DEMONSTRATION

The initial terms of this contract called for the use of rental vehicles in conjunction with field tests involving handicapped drivers. A problem was encountered wherein the rental car concessionaires were reluctant to delegate vehicles to this program for the following reasons:

(a) The rental car concessionaires would be without the use of their vehicles for a period of time while the hand control assemblies were fitted into them. This would represent a loss in revenue to the concessionaire while the vehicles were sidelined.

(b) Again, for demonstration purposes, the vehicles fitted with quick release hand controls would not be available to the concessionaire for rental., which would represent a loss in revenue.

(c) The rental car concessionaires were somewhat uncertain of the need for automobiles equipped with hand controls since they seldom receive requests for this service.

It was, therefore, decided that Transport Canada vehicles should be used for both the functional evaluation and field demonstration segments of this project. Instead of a field trial, a demonstration of the principles of the quick release hand control system was arranged for the rental car concessionaires. A questionnaire was given to the managers of the various rental agencies in order to obtain information regarding feasibility of incorporating the removable hand

controls in their vehicles for an extended test period. Invited to attend the demonstration were managers from the following rental car agencies: Avis, Budget, Hertz, Ottawa Car Rentals, and Tilden Rent-A-Car. The responses obtained from Avis, Budget, and Tilden are summarized as follows:

(a) Both Avis and Tilden had received requests for vehicles equipped with hand controls, but only occasionally;

(b) All of the responding concessionaires were interested in participating in a field trial evaluation;

(c) None of the concessionaires felt that the bracketry associated with the hand control attachments would be inconvenient or bothersome to non-paraplegic drivers.

In general, comments received from the rental car agents indicated that there is a potential market for rental vehicles equipped with quick release hand controls. The most attractive feature about the removable hand control units is the ability of the concessionaire to rent the vehicle to normal drivers without the hand controls in place. Thus, the vehicle may be used as a normal rental unit until it is required by a handicapped driver.

10. CONCLUSIONS

This quick release hand control has met all design criteria both as a hand control system, and as a removable unit. The quick conversion characteristics of this system, which enables a normal passenger vehicle to be readily

modified for use by a handicapped driver, offers the rental car concessionaire a simple means by which to attract a larger clientele. It also offers the handicapped driver a mobility which would not normally be available to him in Canada.

Every effort has been made to ensure that the hand control unit, when installed, is a safe and reliable means of providing throttle and brake action to the vehicle by hand manipulation. The use of a D.V.A. approved hand control unit for this design ensures that a standard of safety and integrity has been met by the controller function. Modified brackets and locking mechanisms allow for a factor of safety of about 10 in all loading cases. All quick release features are simple to operate, and provide a positive means of retaining the hand control.

11. RECOMMENDATIONS

The responses from the rental car concessionaires indicate that there is a potential market for hand control equipped rental vehicles, and that the concessionaire managers are willing to participate in an extended field-trial of this concept involving their vehicles.

It is, therefore, recommended that an in-field evaluation take place, utilizing the quick release hand controls in rental vehicles. Possibly, these units may be supplied to the rental car concessionaire which has the highest usership, or which is most willing to allocate some segment of funding for this venture.

Data collected from the concessionaires may reveal:

(a) usership and therefore the need for this service; and,

(b) refinements which may be made to the hand controls configuration.

APPENDIX A

Memo from R. Corkett To R. Nishizaki Re:
Quick Release Hand Controls for Rental Vehicles

Government of Canada / Gouvernement du Canada

MEMORANDUM NOTE DE SERVICE

DPM-Montreal
Attn: L. Nishizaki

c.c. DTH/X
KSST/A

R. Corkett, DAPD/A Tower C 595-2647

SECURITY CLASSIFICATION / DE SÉCURITÉ

OUR FILE / NOTRE RÉFÉRENCE
5150-8-10 (DAPD/A)

YOUR FILE / VOTRE RÉFÉRENCE

DATE
May 20, 1981

SUBJECT / OBJET QUICK RELEASE HAND CONTROLS FOR RENTAL VEHICLES

Your memorandum to J. Tait of April 30, 1981 requesting information regarding the above subject was passed to this office for direct reply. The following points address the questions raised in your memorandum:

a) A policy for hand controlled rental cars at Transport Canada airports has yet to be developed. Recent discussions with car rental agencies indicate mixed feelings on their part toward the installation of hand controls. The TDC project will certainly be of assistance in the development of a Transport Canada policy.

b) The Canadian Human Rights Act amendments, which may be passed this year, will affect Transport Canada activities through five of the proposed revisions:

i) the extension of the coverage to include mentally handicapped persons;

ii) the prohibition of discrimination against physically and mentally handicapped persons in the provision of "goods, services, facilities and accommodations generally available to the public";

iii) the requirement for development programmes to be submitted by "purveyors of services" covering their plans to eliminate or reduce discrimination along with time frames for compliance;

iv) the establishment of monitoring agencies to ensure development programmes are being complied with; and

v) the requirement for government departments to review all grants, contributions and licences for non-discrimination. This will not affect existing programmes or licences, but will require all new contracts to be non-discriminatory.

.../2

Car rental concessionaires will fall under the Act for purposes of servicing most air and rail terminals (and possibly bus and ferry). Those under federal jurisdiction would be required to provide accessible vehicles, probably with the stipulation, at least initially, that some advance notice be given by handicapped consumers. Businesses located off federal lands would not come under the Act because they would be municipally or provincially regulated.

c) Current car rental concession agreements run from January 1, 1980 to December 31, 1984 and make no reference to hand controls or other devices to assist handicapped operators.

R.W. Corkett,
Senior Policy Advisor

APPENDIX B

Responses from Provincial and Territorial Licencing Bureaus Re: Regulations Governing Hand Controls

GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
DEPARTMENT OF TRANSPORTATION
Motor Registration Division
Viking Building, Crosbie Road
St. John's, Newfoundland
A1C 5T4

1981 09 17

Mr. J. Nicklin, P. Eng.
Davis Engineering
Consulting Engineers
1481 Cyrville Road
Ottawa, Ontario
K1B 3L7

Dear Sir:

Re: Your File No. C81-84

This will refer to your letter of 1981 08 12 addressed to Mr. C. Monk concerning hand controls in automobiles for handicapped people.

Please be advised that we do no have provincial legislation or regulations on this subject.

Yours faithfully,

G.M. HUSSEY
Deputy Registrar of Motor Vehicles

/cm

SEP 21 1981

Department of Transportation
Registry of Motor Vehicles
6061 Young Street, Halifax, Nova Scotia

September 11, 1981

Mr. J. Nicklin
Davis Engineering
Consulting Engineers
1481 Cyrville Rd.
Ottawa, Ontario
K1B 3L7

Dear Mr. Nicklin:

This will acknowledge your letter of August 12, 1981, regarding hand controls on vehicles driven by handicapped persons.

We have looked into our existing Regulations and wish to advise, that at the present time there are no Regulations governing the use of such hand controls, including any standards on the equipment or their installation.

We do, however, feel that the objective of your undertaking is a noble one, and therefore wish you success in the endeavor.

With regards.

Yours very truly,

S.M. Ali, P.Eng., M.Eng.,
Acting Director
Motor Vehicle Inspection
Division

SMA*ec
c.c. J.S. Nicholson, Supervisor
Motor Vehicle Inspection

SEP 16 1981

Province of British Columbia

Ministry of Transportation and Highways

Superintendent of Motor-vehicles
Motor-vehicle Branch
Victoria
British Columbia
V8T 5A3
Telephone: 387- 6634

IN REPLY QUOTE FILE No. ... YOUR FILE No. C81-84 ... PLEASE MARK FOR ATTENTION OF

Vehicle Inspection
DIVISION

September 9, 1981

Mr. J. Nicklin
Davis Engineering
Consulting Engineers
1481 Cyrville Road
Ottawa, Ontario
K1B 3L7

Dear Mr. Nicklin:

Thank you for your letter of August 12, 1981 concerning B.C. regulations regarding hand controls in motor vehicles. The Province of British Columbia has no regulation regarding hand controls nor do we have any specific material requirements.

If I can be of further assistance please contact me again.

Yours truly

G.W. Brown
Manager
Vehicle Inspection
Division

GWB:sab

SEP 16 1981

Government of Yukon

BOX 2703, WHITEHORSE, YUKON Y1A 2C6 TELEPHONE 403-667-5811 TELEX 036-8-260

667-5313 MOTOR VEHICLES BRANCH

OUR FILE 3355-33
YOUR FILE C81-84

81.08.27

J. Nicklin
Davis Engineering
1481 Cyrville Rd.
Ottawa, Ontario
K1B 3L7

Dear Mr. Nicklin;

In reply to your letter dated August 12, 1981.

The Yukon does not have legislation governing materials and construction of controller units for handicapped people. Amendment to the Motor Vehicle Ordinance regarding materials and construction of controller units are not planned in the near future.

Yours truly,

R.Z. Iwanicki
Deputy Registrar of Motor Vehicles

RZI/md1

SEP 08 1981

Alberta
TRANSPORTATION

Transportation Safety Branch

2nd Floor, Boardwalk Building
10220 - 103rd Street
Edmonton, Alberta, Canada
T5J 0Y8

September 3, 1981

Mr. J. Nicklin, P. Eng.
Davis Engineering Ltd.
1481 Cyrville Road
OTTAWA, Ontario
K1B 3L7

Dear Mr. Nicklin:

This is in response to your August 12, 1981 letter to Alberta Transportation on motor vehicle hand controls.

There are no direct regulations or statutes regarding hand control requirements for Alberta motor vehicles. We do, however, review new design and installations regarding function and safety.

For further contact on such matters, please contact the writer.

Yours truly,

John D. Law, P. Eng.
Transportation Safety
Branch

JLD/ed

SEP 08 1981

Province of Manitoba
Department of Highways
Safety Division & Driver Improvement Clinic

141 Doncaster Street
Winnipeg, Manitoba
R3N 1W5

August 27, 1981

Mr. J. Nicklin, P. Eng.
Davis Engineering
1481 Cyrville Road
OTTAWA, Ontario
K1B 3L7

Dear Mr. Nicklin:

In reply to your recent letter, the Province of Manitoba has no specific regulations governing the materials or construction of hand controls.

A section of our Highway Traffic Act states the standards for equipment for vehicles may be those approved by:

- Canadian Standards Association
- American Association of Motor Vehicle Administrators
- Motor Vehicle Safety Act (Canada)

The Registrar also has the authority to refuse to register any vehicle which in his opinion, would, if operated on a highway, create a hazard or be likely to endanger persons or property.

Yours truly,

W. E. Kurz
Chief Examiner

WEK/pmp
cc P. Dygala
cc

Saskatchewan

Saskatchewan
Highway Traffic
Board

2260-11th Ave.
Regina, Canada
S4P 3V7

Your File _____

Our File _____

August 26, 1981

Davis Engineering
1481 Cyrville Road
Ottawa, Ontario
K1B 3L7

Attention: J. Nicklin, P.Eng.

Dear Sirs:

There is nothing in the Act or Regulations which specifically refer to hand controls for the disabled. There is however, a catchall clause referring to unsafe vehicles.

Would appreciate seeing the plans and design criteria of the device before it is sold in this province.

Yours sincerely,

John Hammond
Vehicle Standards
Engineer

JH/cm

SEP 1981

DEPARTMENT OF TRANSPORTATION
MOTOR VEHICLE DIVISION
P.O. BOX 6000, FREDERICTON, N.B.
E3B 5H1

MINISTERE DES TRANSPORTS
DIVISION DES VEHICULES A MOTEUR
C.P. 6000, FREDERICTON, N.-B.
E3B 5H1

August 24, 1981

Mr. J. Nicklin, P. Eng.
W. R. Davis Engineering Limited
1481 Cyrville Road
Ottawa, Ontario
K1B 3L7

Dear Mr. Nicklin:

This is in response to your letter dated August 12, 1981 in connection with manual controls in motor vehicles for use by the handicapped.

We have no specific standards in our motor vehicle law that describes these devices or any controller unit that may go with them. When we test a handicapped person and some device is required by that person, we simply check each individual installation to see that it is adequate to allow that handicapped person to operate the motor vehicle safely.

Trusting this is the information that you were seeking.

Yours very truly,

J. Edward Ferris
Registrar & Director of Motor Vehicles

DHS/lh

AUG 28 1981

Régie de
l'assurance automobile
du Québec

Quebec City, 1981-10-09

Mr. J. Nicklin, P.Eng.
Davis Engineering
1481, Cyrville Road
Ottawa
K1B 3L7

RE: Hand controls

Dear Mr. Nicklin,

Madame Micheline Fortin asked me to answer your letter concerning a devise that could be installed and taken out of rental automobiles and used as a hand controls for the handicapped.

The Quebec province does not specify any standards or regulations governing the use of hand controls. We are very interested in your findings and we would appreciate if you could send us a copy of your study.

Please do not hesitate to contact us, if me can be helpfull in any way.

Sincerely yours,

Bernard LeFrançois, P.Eng.
Chief of mechanical inspection,
eastern region
1279, boul. Charest ouest, 6e étage
Québec (Québec) G1N 4K7

/dr

OCT 20 1981

APPENDIX C

Memo from H. Ducharme to R. Nishizaki Re: Hand Controls for Rental Vehicles at Transport Canada Airports

Appendix C

Government of Canada / Gouvernement du Canada

MEMORANDUM NOTE DE SERVICE

DPM
Attention: R. Nishisaki

KSST/A - H. Ducharme

SECURITY CLASSIFICATION / DE SÉCURITÉ

OUR FILE / NOTRE RÉFÉRENCE
5150-8-10 (KSST)

YOUR FILE / VOTRE RÉFÉRENCE

DATE
June 16, 1981

SUBJECT / OBJET **Hand Controls for Rental Vehicles At Transport Canada Airports**

This refers to our recent conversation regarding the automobile modification project sponsored by DTS. Although this project is really a surface administration project, the results of your study will assist us in the formulation of a position paper for rental vehicles at airports.

As I have already done some research on the provision of hand-controlled cars at airports, I have prepared the following information which might be of assistance in your project.

In May, I have surveyed the major car rental agencies operating at international and major national airports. The companies surveyed were: Avis, Budget, Econo-car, Hertz and Tilden. The objective of the telephone survey was to find out if these companies presently provided hand-controlled cars and if they had immediate plans to provide.

The officials contacted were:

Budget - Mr. Charles Hardy, Marketing Manager, (Toronto)

Tilden - Mr. Ted Tilden, President, (Montreal), Mr. Keith Nash, Operations Manager, (Toronto)

Avis - Mr. H.J. Boschouwers, Secretary, (Montreal).

Hertz - Mr. R. Dunbar (Rexdale)

Econocar - Mr. J. Leroux, President, (Montreal).

No company is presently providing hand-controlled cars in Canadian airports and none has specific plans to provide. Avis has occasionally installed some hand controls on its cars but there were owned either by an individual or by an association.

.../2

All companies claim there is no demand for this service but they also realize that this is not a valid argument.

Mixed reactions were perceived as to the suggestion of provision of the service in the near future. It ranged from a negative reaction of more government intrusion into the running of their business to a willingness to offer the service. This latter reaction was however tied to a need to make it a mandatory requirement for future tender evaluations.

All companies lacked technical information about the provision of such a service and would welcome any assistance or any specific recommendation from Transport Canada. The type of questions that should be answered are.

1. On what type of cars can hand controls be installed? Any restrictions?
2. Where is the gear control?
3. Are left hand controls available?
4. How long does it take to install?
5. Can it be done by someone who is not a mechanic?
6. What about insurance?
7. How many types of kits are available?
8. Any safety tests available?
9. Which kit would Transport Canada recommend?

All company officials were informed of the impending changes to the Canadian Human Rights Act which would extend protection against discrimination in the provision of goods and services to the handicapped.

Also attached for your information is a summary which will indicate which companies are providing hand-controls at American airports along with an indication of the volume of traffic at that airport. Table II is related to major Canadian airports.

I hope this will be of assistance in your project. As we are very much interested in this project, we would appreciate to be kept informed of the progress made.

H. Ducharme

H. Ducharme

Attach.

TABLE 1

PROVISION OF HAND CONTROL CARS
AT AMERICAN AIRPORTS

Name of Airport	Rental Company *				Total Enplaned/ Deplaned Passengers (millions) **
	Avis	Hertz	National	Unknown	
Alburque, Nm.	A7				2.4
Allentown, Pa.	A7				.6
Atlanta, Ga.	A7	H7			42.
Austin, Texas	A7				1.3
Baltimore, Ml.	A7	H7			3.6
Birmingham, Al.	A7	H7			16.
Boston, Mass.	A7	H2	N7		14.
Burbank, Ca.		H			2.2
Charlotte, Mc.		H7	N7		3.
Chicago, Il.		H7	N7		42.
Cincinatti, Ohio	A7				3.2
Cleveland, Ohio	A7	H7			7.4
Colorado Springs	A7	H7			.6
Dallas, Texas	A7	H7	N7		23.
Dayton, Ohio	A				3.
Daytona Beach, Fl.	A7	H7	N7		.8
Ft. Lauderdale, Fl.	A7	H7			6.
G-Spartanburg,					.7
Honolulu, Hi.	A7				12.
Indianapolis, In.	A				3.4
Islip, N.Y.	A7				-
Jackson, Ms.	A7				.8
Jacksonville, Fl.	A7	H7			1.8
Jefferson City, Mo.	A7	H7			-
Kansas City, Mo.		H7			6.
Las Vegas, Nv.	A7	H7			10.
Los Angeles, Ca.	A7	H7	N7		32.
Louisville, Ky.	A7				2.2
Melbourne, Fl.	A7	H7			-
Memphis, Tn.		H7			5.

TABLE 2

MAJOR CAR RENTAL AGENCIES
SELECTED T.C. AIRPORTS

Airport	Avis	Budget	Hertz	Tilden	Econo-car	Holiday	Total Enplaned/ Deplaned Passengers (millions) *
Halifax	X	X	X	X		X	1.5
Montreal, Dorval	X	X	X	X	X		6.1
Montreal, Mirabel	X	X	X	X	X		1.5
Ottawa	X	X		X	X	X	1.8
Toronto	X	X	X	X		X	13.7
Winnipeg	X		X	X		X	2.2
Calgary	X	X	X	X		X	3.6
Edmonton	X	X	X	X	X		2.2
Vancouver	X	X	X	X		X	6.5

* Source: Major Canadian Airports
Mainline Unit Toll International Air Charter Services, January 1981.

APPENDIX D

Veterans Administration
Acceptance Standards for Hand Controls

APPENDIX D

Condensed from the "Program Guide - Prosthetic and Sensory Aids Services" - Veterans Administration.

3.0 Veterans Administration Standards

3.1 Qualifications. Special automotive driving aids provided by the VA for veteran users shall be qualified by tests conducted periodically at VAPC. The tests set forth in the following sections shall be applied.

3.2 Major Components. Among major components to be tested are:

(a) Linkages
(b) Terminal Brake and Accelerator Connectors
(c) Control Lever
(d) Attachment Hardware
(e) Accessories, including Dimmer Switch, Horn Button, or any other adaption designed to operate automotive auxiliary equipment.

3.3 Strength of Materials.

3.3.1 Standard. All components shall be constructed to prevent permanent deformation under the stress of normal usage which varies greatly depending on whether power brakes are used.

3.3.2 Specification. Fully assembled and installed hand control systems limited to motor vehicles with power brakes shall not be permanently deformed under a static load of 62.5 lbs. (278 newtons) applied to the handle of the Control Lever. Hand control systems for cars without power brakes shall meet the same requirements under a static load of 150 lbs. (667.2 newtons) applied to the handle of the Control Lever (FMVSS 105).

3.3.3 Tests.

3.3.3.1 Test 1. A static load of 62.5 lbs. (278 newtons) is applied to the handle of the Control Lever to simulate brake actuation of the adaptive system for vehicles with power brakes. For vehicles without power brakes a static load of 150 lbs. (667.2 newtons) is applied to the handle of the Control Lever. The load shall remain on the Control Lever for a period of 30 to 35 seconds. Changes in alignment or deformation shall be determined by inspection and measurement.

3.3.3.2 Test 2. Fatigue life is simulated in the laboratory applying 80% of the 62.5 lb. proof load, i.e., a 50 lb. (222.4 newton) force 250,000 times to actuate the brake control, and a 10 lb. (44.48 newton) force to actuate the accelerator control of an assembled hand control system. These forces are applied to the handle of the control lever. One (1) complete cycle of brake or accelerator actuation shall be accomplished in 0.5-1.0 seconds to simulate average time responses required in driving

an automobile. For controls designed for use on vehicles without power brakes, fatigue life is simulated by applying 80% of the 150 lb. proof load, i.e., a 120 lb. (533.8 newton) force to actuate the brake control in a manner similar to the requirements given for power brake type hand control systems. Periodic inspection of the test in intervals of 50,000 cycles are made, and changes in alignment, wear, or loosening of fasteners are recorded.

3.3.3.3 Test 3. In cases where Test 2 is not feasible (e.g. individual components or linkage sub-assemblies), acceptable strength is verified by generating a 4.6 g load (2.54 mm displacement at 30 Hz, i.e., ± 1.27 mm from zero reference) through the test sample on a laboratory shaker. The vibratory motion is maintained for 2 hours in each the axial and transverse direction of assembly. Components that could be adversely effected by the heat produced at 30 Hz (e.g. rubber parts) shall not be included in this cyclic test.

3.4 Resistance to Corrosion.

3.4.1 Standard. All components of adaptive automotive driving aids shall be resistant to corrosion. In addition, the provisions of FMVSS No. 107 in regard to "specular gloss" shall apply. All components shall be plated or otherwise treated with glare-free industrial finishes. Each system or device submitted for evaluation shall be accompanied by a statement describing the finish material and process.

3.4.2 Test 4. A fully assembled sample unit shall be subjected to a salt spray (fog) test in accordance with the latest ASTM B 117, Method of Salt Spray (Fog) Testing, for a period of 50 hours, consisting of two periods of 24 hour exposure and 1 hour drying time each. (Reference SAE Standard J575 (e) "Test for Motor Vehicle Lighting Devices and Components"). Immediately after the preceding test has been completed, there shall be no evidence of sufficient corrosion to affect the proper functioning of the device or to soil hands or clothing.

3.5 Fasteners.

3.5.1 Standard. All fasteners required for the assembly and complete installation of an adaptive control system in a particular model passenger automobile shall be provided by the manufacturer. Fasteners shall be designed or treated for resistance to vibration.

3.5.2 Specification. All fasteners of an assembled hand control system shall remain tightened securely within a 15% preload torque drop under vibratory motion producing a 4.6 g load (2.54 mm displacement at 30 Hz, i.e., ± 1.27 mm from zero reference) in the axial and transverse direction of assembly.

3.5.3 Test 5. Resistance to vibration shall be tested in the laboratory by vibrating of the fully assembled control system, including all installation hardware. A vibratory force causing 2.54 mm displacement (± 1.27 mm from zero reference) at 30 Hz shall be applied in the axial and transverse direction of the assembly for 30 minutes each. Locking torques of all fasteners shall be measured prior to testing, and changes in preload values shall be recorded after completion of the vibration test. The fasteners shall retain preload torques within a 15% allowable variation after testing.

3.7 Safety.

3.7.1 Sharp Edges and Projections.

3.7.1.1 Standard and Specification. All adaptive automotive control systems shall be free of sharp edges and jagged projections to minimize injuries and damage to clothing of both handicapped and non-handicapped drivers (FMVSS 201).

3.7.1.2 Test 7. A fully assembled system shall be visually inspected in a laboratory set-up (simulator). All hazardous features shall be a cause for rejection of a device.

3.7.2 Conventional Use of Motor Vehicle.

3.7.2.1 Standard. All adaptive control devices shall be designed to permit the conventional use of the standard automotive controls by non-handicapped drivers.

3.7.2.2 Specification. Brake and accelerator pedals shall remain unobstructed after adaptive controls have been properly installed according to the manufacturer's instructions.

3.7.2.3 Test 8. Acceptability of a particular design shall be verified by observation in the laboratory, where it shall be clearly demonstrated that brake and accelerator connecting hardware shall not obstruct control pedals used by drivers in the normal mode.

3.7.3 Neutral Position of Control System.

3.7.3.1 Standard and Specification. Hand control systems shall be balanced so that neither the brake nor the accelerator are actuated in the hands-off mode (FMVSS 124).

3.7.3.2 Test 9. Acceptability of a particular device shall be verified in the laboratory by means of a simulated automotive installation.

3.8 Mode of Operation.

3.8.1 Acceleration and Brake Motion.

3.8.1.1 Standard and Specification. Adaptive hand control systems shall be designed to require distinctly different motions for acceleration and brake actuation.

3.8.1.2 Test 10. Functional adequacy shall be verified by observation in the laboratory where it shall be evident that distinctly different motions for actuation of the accelerator and brake pedals are provided.

3.8.2 Restriction of Accelerator Motion for Mechanically Linked Hand Controls.

3.8.2.1 Standard and Specification. Adaptive hand control systems shall not permit actuation of the accelerator by forward inertial movement of the driver.

3.8.2.2 Test 11. Acceptability of an adaptive automotive hand control system shall be verified by observation in the laboratory where it shall be evident that the accelerator cannot be actuated by a forward push away from the driver.

4.0 Installation of Adaptive Equipment to Passenger Automobiles.

4.1 Method of Attachment.

4.1.1 Standard. Manufacturers shall specify the appropriate method of installation for each type of automobile for which his device is designed.

4.1.2 Specification. A brochure containing written and graphic instructions for installing each control system shall be provided by the manufacturer for each type, year and make of automobile for which the product is intended.

4.2 Certified Installation. Upon completion, the installation must be certified as complete and safe. The VA strongly urges that installation be accomplished by highly experienced auto mechanics who have familiarized themselves with these devices.

4.3 Safety Features of the Automotive Steering Column. Installation of an adaptive hand control system shall not interfere with the collapsibility of the steering column or any other safety features of the automobile. The collapse of a steering column in the event of a collision shall not expose the driver to hardware normally behind the steering wheel. In such cases, it is assumed that the driver impacts with the steering wheel (FMVSS 203).

4.4 Alterations of the Passenger Vehicle. The use of adaptive equipment shall not result in alterations of the passenger automobile which impair or reduce other safety features. Although it is desirable not to deface the interior, this desire is of secondary importance to assuring the secure attachment of all devices.

4.5 Installation Instructions. Complete installation instructions shall be packaged with each adaptive automotive control device (4.1), including a parts list of components. The instructions shall be clear and free of ambiguity, and shall be supplemented by photos and illustrations to facilitate the installation of the device. The manufacturer's concern for proper installation shall be clearly stated. A source of assistance and/or information (phone number and address) shall be provided.

4.6 Use Instructions. Complete instructions on the operation and use of the driving controls shall be packaged with each driving aid. These instructions shall be supplemented by photos and illustrations as needed. Suitable caution on gaining familiarity with a new driving method shall be given prominence.

APPENDIX E

Responses from Rental Car Commissionaires

DEMONSTRATION OF QUICK-RELEASE HAND CONTROLS

In order for us to be able to identify the responses received from each concessionaire, would you please either affix a business card to this questionnaire, or fill in the following:

COMPANY NAME: Hertz Rent A Car
320 Queen Street, Ottawa, Ontario

YOUR NAME: Mary Coghlan

POSITION IN COMPANY: MANAGER

DEMONSTRATION OF QUICK-RELEASE HAND CONTROLS

Concessionaire Questionnaire:

Following the demonstration of the quick-release hand control unit, we at Davis Engineering would request that you express your opinions or views on the installation which you have just seen. Kindly consider the following questions, and add any comments or criticisms which you feel would be of interest to us.

1. Have you ever had any requests for hand control equipped vehicles by handicapped individuals?

   yes, but only twice

2. Would you, the concessionaire, have any interest in the use of this or a similar quick-release hand control in your organization?

   yes

3. Is your organization suitably equipped to be able to store, install, and remove hand controls similar to the unit which you have just seen?

   yes.

4. Do you feel that the brackets used for the adaptation of the hand controls when not in use would prove to be an inconvenience to non-paraplegic drivers?

No

5. If required, would your organization be willing to participate in a field trial evaluation (for a period of 4 - 6 months) of these hand controls using your rental vehicles?

yes

6. With advertising, do you feel that there would be a good market for this service?

yes

We at Davis Engineering, on behalf of Transport Canada, want to take this opportunity to thank you for your cooperation in this hand controls demonstration. If you have any further comments or questions, please contact myself, J. Nicklin, or Tony Bosik at Davis Engineering (telephone no. 746-3760).

DEMONSTRATION OF QUICK-RELEASE HAND CONTROLS

In order for us to be able to identify the responses received from each concessionaire, would you please either affix a business card to this questionnaire, or fill in the following:

COMPANY NAME: BUDGET RENT A CAR
443 SOMERSET ST W. OTTAWA

YOUR NAME: MERLIN ARMSTRONG

POSITION IN COMPANY: MANAGER PHONE - 232-1526

DEMONSTRATION OF QUICK-RELEASE HAND CONTROLS

Concessionaire Questionnaire:

Following the demonstration of the quick-release hand control unit, we at Davis Engineering would request that you express your opinions or views on the installation which you have just seen. Kindly consider the following questions, and add any comments or criticisms which you feel would be of interest to us.

1. Have you ever had any requests for hand control equipped vehicles by handicapped individuals?

   No

2. Would you, the concessionaire, have any interest in the use of this or a similar quick-release hand control in your organization?

   Yes

3. Is your organization suitably equipped to be able to store, install, and remove hand controls similar to the unit which you have just seen?

   Yes

4. Do you feel that the brackets used for the adaptation of the hand controls when not in use would prove to be an inconvenience to non-paraplegic drivers?

No

5. If required, would your organization be willing to participate in a field trial evaluation (for a period of 4 - 6 months) of these hand controls using your rental vehicles?

YES

6. With advertising, do you feel that there would be a good market for this service?

POSSIBLY

We at Davis Engineering, on behalf of Transport Canada, want to take this opportunity to thank you for your cooperation in this hand controls demonstration. If you have any further comments or questions, please contact myself, J. Nicklin, or Tony Bosik at Davis Engineering (telephone no. 746-3760).

DEMONSTRATION OF QUICK-RELEASE HAND CONTROLS

In order for us to be able to identify the responses received from each concessionaire, would you please either affix a business card to this questionnaire, or fill in the following:

COMPANY NAME: TILDEN RENT A CAR

YOUR NAME: BRIAN LONSDALE

POSITION IN COMPANY: SUPERVISOR

DEMONSTRATION OF QUICK-RELEASE HAND CONTROLS

Concessionaire Questionnaire:

Following the demonstration of the quick-release hand control unit, we at Davis Engineering would request that you express your opinions or views on the installation which you have just seen. Kindly consider the following questions, and add any comments or criticisms which you feel would be of interest to us.

1. Have you ever had any requests for hand control equipped vehicles by handicapped individuals?

   YES. (MINIMAL) HOWEVER THIS MAY INCREASE WITH PROMOTION & ADVERTISING

2. Would you, the concessionaire, have any interest in the use of this or a similar quick-release hand control in your organization?

   YES! DEPENDING ON COST

3. Is your organization suitably equipped to be able to store, install, and remove hand controls similar to the unit which you have just seen?

   YES. MY ONLY CONCERN IS IF THERE WERE ANY ERROR IN PLACING PINS IT COULD HAVE SERIOUS CONSEQUENCES.

4. Do you feel that the brackets used for the adaptation of the hand controls when not in use would prove to be an inconvenience to non-paraplegic drivers?

IT MAY CAUSE A PROBLEM ABOVE RIGHT KNEE.

5. If required, would your organization be willing to participate in a field trial evaluation (for a period of 4 - 6 months) of these hand controls using your rental vehicles?

I BELIEVE SO!!

6. With advertising, do you feel that there would be a good market for this service?

DIFFICULT TO SAY IF A GOOD MARKET BUT I FEEL THERE IS A MARKET ONLY TIME WOULD DETERMINE IF IT JUSTIFIED THE COST.

We at Davis Engineering, on behalf of Transport Canada, want to take this opportunity to thank you for your cooperation in this hand controls demonstration. If you have any further comments or questions, please contact myself, J. Nicklin, or Tony Bosik at Davis Engineering (telephone no. 746-3760).

APPENDIX F

List of Persons or Organizations Contacted

LIST OF PERSONS OR ORGANIZATIONS CONTACTED

I) Provincial Government Contact List

a) Mr. George Harker, Assistant Director,
Transportation Safety Branch,
Alberta Transportation,
2nd Floor, Boardwalk Bldg.,
10220-103 Street,
Edmonton, Alberta.
T5J 0Y8 403-831-2211

b) Mr. R.G. Whitlock,
Superintendent of Motor Vehicles,
Motor Vehicle Branch,
Victoria, B.C.
V8V 2H3 604-387-3140

c) Mr. P. Dygala,
Assistant Deputy Minister (MVB),
Motor Vehicle Branch,
Department of Highways,
Office of the Registrar,
1075 Portage Avenue
Winnipeg, Manitoba.
R3G 0S1 204-775-0281

d) Mr. J.E. Ferris,
Registrar of Motor Vehicles,
Motor Vehicle Branch,
Department of Provincial Secretary,
Fredericton, N.B.
E3B 5H1 506-453-2400

e) Mr. C. Monk,
Equipment Manager,
Department of Highways,
Government of Newfoundland and Labrador,
St. John's, Newfoundland.
A1C 5T4 709-737-2519

I) Provincial Government Contact List (Cont'd)

f) Mr. W.G. Johns,
Registrar of Motor Vehicles,
Government of the N.W. Territories,
Yellowknife, N.W.T.
X0E 1H0 403-873-7401

g) Mr. S.M. Ali, P. Eng.,
Director,
Motor Vehicle Inspection Division,
Department of Transportation,
Registry of Motor Vehicles,
6061 Young Street,
Metro Centre,
P.O. Box 156,
Halifax, N.S.
B3J 2M4 902-424-4122

h) Mr. M.W. Hattin, P. Eng.,
Manager, Vehicle Standards Office,
Program Development Branch,
Ministry of Transportation and Communications,
1201 Wilson Avenue,
East Building,
Downsview, Ontario.
M3M 1J8 416-248-3548

i) Mr. W.R. Brennan, P. Eng.,
Secretary,
Public Utilities Commission,
Charlottetwon, P.E.I.
C1A 7N8 902-892-3501

j) Mlle Micheline Fortin
Directrice des Programmes de Sécurité routière
Régie de l'Assurance automobile du Québec
1279, boulevard Charest ouest, 6e étage
Québec (Québec)
G1N 4K7 187-9-643-2096

k) Mr. John W. Hammond,
Vehicle Standards Engineer,
Highway Traffic Board,
Saskatchewan Department of Highway & Transportation,
2260-11th Ave., 12th Floor,
Regina, Sask.
S4P 3V7 306-565-4033

I) Provincial Government Contact List (Cont'd)

l) Mr. H.D. Spray,
Registrar of Motor Vehicles,
Whitehorse, Y.T.
Y1A 2C6 403-667-7256

II) Other Contacts

a) Mr. Charlie Sheppie,
Communications Research Centre,
Ottawa, Ontario

b) Mr. Bill White,
C.O.P.O.H.,
Winnipeg, Manitoba

c) Larry's Driving School,
Ottawa, Ontario

d) Rite-Way Driving School
Ottawa, Ontario

e) Ms. Betty Dionne, Rehabilitation Institute of Ottawa,
Ottawa, Ontario

f) Mr. C. Hardy, Marketing Manager,
Budget, Toronto, Ontario

g) Mr. Tyrone,
Hertz, Toronto, Ontario

h) Mr. K. Nash,
Tilden, Toronto, Ontario

i) Mr. D. O'Connell,
Via Rail,
Montreal, P.Q.

j) Ms. M. Young,
Crippled Children's Hospital,
Toronto, Ontario

k) Mr. R. Roomis,
Special Committee for the Disabled,
Ottawa, Ontario

l) Ms. M. Trudeau,
Association des Paraplégiques du Quebec,
Montreal, P.Q.

II) Other Contacts (Cont'd)

m) Mr. T. Fath,
Automotive Safety Engineering,
Transport Canada,
Ottawa, Ontario

n) Mr. W. Dagg,
Para-Industries,
Ottawa, Ontario

o) Ms. A. Gaylord,
Royal Ottawa Hospital,
Ottawa, Ontario

p) Mr. G. Tremblay,
B-P Service, St. Charles Rd.,
Montreal, P.Q.

q) Mr. T. Reichenberger,
Department of Veterans' Affairs,
New York, N.Y.

r) Mr. K. Labron,
Ken Labron Ltd.,
Vancouver, B.C.

s) Ms. M. Coghlan,
Avis Rent-A-Car,
Ottawa, Ontario

t) Mr. M. Armstrong,
Budget Rent-A-Car,
Ottawa, Ontario

u) Mr. J. Cormier,
Hertz Rent-A-Car,
Ottawa, Ontario

v) Mr. K. Keshwan,
Ottawa Car Rentals,
Ottawa, Ontario

w) Mr. R. Richer,
Tilden Rent-A-Car,
Ottawa, Ontario

x) Mr. B. Lonsdale, Supervisor,
Tilden Rent-A-Car,
Ottawa, Ontario

II) Other Contacts (Cont'd)

y) Mr. R. Corkett,
Transport Canada,
Ottawa, Ontario

z) Mr. D. N. McDonald,
Road Safety-Surface,
Transport Canada,
Ottawa, Ontario

POOR

QUALITY

ORIGINAL